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SOVIET ARCTIC RESEARCH IN 1954

In the spring of 1954, Arctic research was begun by the Soviet Union on a scale hitherto unknown. One of the most important components of this research is the establishment of two drifting stations on polar ice, set up under the combined sponsorship of the Main Administration of the Northern Sea Route [Ministry of Maritime and River Fleet] and the Academy of Sciences USSR. (1) Personnel for the drifting stations was drawn from the Main Administration of the Northern Sea Route, the Academy of Sciences USSR, the Main Administration of Hydrometeorological Service, and other organizations. (2)

The mission of the drifting stations is to study all phases of Arctic conditions -- weather, ice, water depths, geology of the ocean floor, etc. It is also expected that the drift of at least one station will carry it over the underwater range imeni Lomonosov and allow more precise observations of this feature. Studies will be made of life in the Arctic Ocean during all four seasons. (3) The observations to be made will not only broaden knowledge of the Arctic in general, but will more specifically allow more accurate weather and ice forecasts to be made for the Northern Sea Route. (2)

One of the drifting stations was set on the ice at 86 00 N 175 45 W. This station, designated as Severnyy Polyus-3, is headed by A. F. Trishnikov, Candidate of Geographic Sciences, Hero of Socialist Labor. Severnyy Polyus-3 is drifting to the northeast, and according to a fix of 15 July was located in the area of 88 02 N 151 40 W.

The other station, set on the ice at 75 48 N 175 25 W, is headed by Ye. I. Tolstikov, Candidate of Geographic Sciences. This station is drifting in a northwesterly direction, and a fix on 15 July placed it at 77 22 N 174 20 E. (1) By 3 August, after over 3 months' drift, the station had moved more than 400 kilometers and was at the edge of the continental slope. (7)

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The assault on the Central Arctic began from the east in early spring, when a group of pilots under the direction of Polar Aviators Titlov and Kotov began flights over the Arctic ice in search of suitable locations for the drifting stations.(2)

The main body of the expedition, including Burkhanov, its chief, V. V. Frolov, director of the Arctic Institute, and Zaytsev, deputy chief of the expedition, left for the Arctic from Moscow aboard three planes: a four-engine transport PE-8 (commanded by Zadkov), a two-engine IL-12 (commanded by Shatrov), and a two-engine LI-2.

The group flew first from Moscow to Arkhangel'sk. From there they proceeded to Dikson Island, with one fueling stop en route. At Dikson, the planes landed on an airfield constructed on the frozen strait which separates the island from the mainland.

Dikson serves as the shore base for the expedition. From there the transfer of equipment and fuel begins, first to island and intermediate ice bases, and finally to Cherevichnyy's air squadron in the circumpolar area.

At Dikson, the group was informed that Pilot Titlov was already in Chukotka, flying over the area in which Severnyy Polyus-4 would be established.

Vasil'yev had flown to Leningrad, where he was loading equipment for Severnyy Polyus-3; thus the expedition was spread across the entire nation.

From Dikson the planes continued to the east, landing once on the ice of the Kolyma River and then proceeding to Chukotka, where they arrived on the fifth day of the expedition. At Chukotka, the expedition was met by Titlov and Ye. I. Tolstikov, chief of Severnyy Polyus-4, who were accompanied by two other experienced polar aviators, Maslennikov and Zhgun.

Titlov and Tolstikov flew on ahead to search for a drifting station location, and the main body of the expedition took off to establish an intermediate supply camp on the ice. As the plane passed over Wrangel Island, radio contact was established with Titlov, who was at 77 degrees north latitude.

Beyond Wrangel Island, the plane met the aircraft piloted by Zhgun. Together, the two planes proceeded to the north and eventually established an intermediate camp on the ice at a distance of 600 kilometers from the mainland.

By the 12th day of the expedition, a suitable location still had not been found for the drifting station. On this day, however, four planes left Chukotka for the north, and one of these spotted a floe which seemed suitable for the establishment of a drifting station. The plane landed near the floe and eventually the station was established there at a distance of about 700 kilometers from the mainland. [Burkhanov states, in Pravda, 18 July 1954, that this location was found by Titlov and Tolstikov.]

In the meantime, Cherevichnyy's air squadron was transporting cargo from Dikson to initial "jumping off" places for the circumpolar area. Kotov's squadron had completed the assembling of equipment for Severnyy Polyus-3 at shore shipment points.(4)

The drifting station Severnyy Polyus-4 (the first station established) was set on the ice just 15 days after the expedition left Moscow, in contrast to the 2 months required to establish the first Severnyy Polyus in 1937.

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A forward camp was established by the air expedition and a landing area constructed for heavy aircraft. From here food and equipment were transferred to the camp site by helicopters and AN-2 type light planes.

After Severnyy Polyus-4 had been established, attention was turned to Pilot Kotov, whose squadron had the responsibility for setting the more northerly camp, Severnyy Polyus-3, on the ice. Kotov took off from an intermediate base with Treshnikov, chief of the station, and at 86 degrees north latitude discovered old ice suitable for landing his airplane.(5) Although the floe found by Kotov was for aircraft landing, it was not judged satisfactory for a year-round drifting station. For this reason, a study of the surrounding area was made and at a distance of 9 kilometers from the original landing point a floe of old ice was discovered which was 2 meters 70 centimeters thick and which had withstood considerable pressure in the past, judging by the hummocks heaped around its edges. The drifting station was organized on this floe.(6)

A plane from Tiksi was sent to the north shortly after establishment of the advance base, and after hours over the ice, Navigator Morozov brought the plane to the intermediate camp. In the few days since this camp had been established, a great deal had been done. Pilot Moskalenko's LI-2 was on the ice at the camp, and the fuselages of helicopters being unloaded dotted the snow in the area. At the edge of the ice a fuel dump had been established, with carefully stowed barrels of gasoline. Planes flying into the depths of the polar area (the drifting station is about 1,300 kilometers from the mainland) might well need this base for refueling.

From this intermediate camp, the plane from Tiksi proceeded about 500 kilometers to the advance camp where Kotov and Treshnikov were located, 400 kilometers from the North Pole. Treshnikov described the ice floe which he had chosen for the drifting station to the new arrivals -- Burkhanov, chief of the expedition; Frolov, director of the Arctic Institute; and Volkov, hydrologist -- and this group flew to the site in the AN-2. When the location was approved, the LI-2 left without delay to get the equipment for the drifting station.(5)

The area selected for the station was one never previously studied closely. The station Severnyy Polyus-1 was set on the ice further to the west in 1937, and the station Severnyy Polyus-2 began its drift further to the south in 1950.(3)

The aircraft which had gone to the station from Tiksi subsequently carried out a survey flight which carried it over a route never before traveled -- Dixon Island to the North Pole to Chukotka. Landings were made at the location of the mobile scientific squadron (under the direction of M. Ye. Ostrekin) in the circum-polar area and at both the drifting stations.

The expedition into the Arctic areas has been organized and carried out by the most able and experienced men available. In addition to Burkhanov and Frolov, a considerable contribution in planning the expedition was made by the Academy of Sciences USSR. The personal participation of Academician D. I. Shcherbakov and Associate Member of the Academy Fodorov was of particular importance.(2)

The serial phases of the work are being carried out by some of the Soviet Union's finest polar aviators: I. P. Mazuruk, I. I. Cherevichnyy, I. S. Kotov, M. A. Titlov, V. I. Maslennikov, V. N. Zadkov; and navigators: V. I. Akkuratov, V. P. Padalko, and many others.

Ye. I. Tolstikov, chief of Severnyy Polyus-4, is a Communist and Candidate of Geographic Sciences. His specialty is synoptic meteorology, and he has been working in the Arctic since 1937 under a variety of conditions. He has taken part in many high latitude expeditions, wintering at various points along the

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shore of the Arctic Ocean. Tolstikov's entire family may be termed "polar"; his wife is one of his best synoptic meteorologists for the eastern sector of the Arctic, and all of his children have been born within the Arctic Circle.

The deputy chief of this station is Hydrologist A. G. Dralkin, Candidate of Geographic Sciences, who has been connected with Arctic work since 1938.

The chief of Severnyy Polyus-3, A. F. Treshnikov, is a Hero of Socialist Labor and Candidate of Geographic Sciences. He has been widely acclaimed for valuable scientific work carried out during the course of several recent high latitude expeditions.(6) The present expedition is the 14th for Treshnikov.(5)

The members of the drifting stations are for the most part experienced polar personnel. Some of the people at Severnyy Polyus-3, for example, have already spent considerable time on drifting ice: Kanaki, aerologist; Kurko, senior radio officer; Komarov, engineer; Volovich, doctor; Dmitriyev, hydrologist; and Yatsun, cameraman. The head of the meteorological section, Matveychuk, is an old polar hand, having spent many years at Dikson Island. Poslavskiy, aerologist, has devoted 23 years to Arctic research. Ponomarenko, hydrologist, and Malkin, meteorologist, are experienced polar personnel also. Alongside these men work younger scientists such as Shamont'yev, hydrologist, who was graduated from the Higher Arctic Sea School 3 years ago.(3) M. S. Komarov, and outstanding engineer who lost his sight during World War II, is also working at the camp. The young hydrologist, V. A. Shamontov [probably Shamont'yev, mentioned above], is serving as party organizer at Severnyy Polyus-3.(6)

The drifting stations have been supplied with the latest equipment available, including some that was developed specifically for this expedition. Each station has been supplied with GAZ-69 motor vehicles [jeeps] (from the Gor'kiy Automobile Plant) and KD-35 tractors.(2) Both stations have helicopters and small, single-engine planes which have proved invaluable in Arctic exploration.(6)

The living quarters at the stations are of two types: tents (of two sizes) and collapsible houses. In external appearance, the tents resemble domed huts. They have an aluminum pipe frame over which one layer of white cloth and one layer of heavy material has been stretched, leaving an air space between the two. The floors are made of three layers: waterproof fabric, deer hides, and plywood. Each tent is provided with a gas plate for heating.(3)

The portable houses have double walls with foam insulating material between them.(6) The houses are heated by coal and gas, and each accommodates four men. (3) Each house weighs 800 kilograms when assembled.(6)

The camps have been divided into separate areas according to the type of research being carried on; i.e., aerology, hydrology, etc. Tables have been set up inside tents and leads brought in from self-recording instruments. Equipment which requires protection from inclement weather and low temperatures is in heated tents.

Scientific work carried out by the drifting stations encompasses almost all phases of Arctic research. Systematic soundings are made of the ocean depth and bottom samples are raised. Temperatures of the water at various depths are taken with the aid of a bathometer equipped with reversing thermometers. Continuing analysis of the chemical composition of the water is also included in the program, as is the study of ocean currents. Much of this work is being carried out with new equipment developed by the Arctic Institute. Aerological and meteorological reports are sent out eight times per day by the drifting stations.(3)

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Data already gathered confirm the belief that the bottom of the Arctic Ocean is of the same type as the Mediterranean Sea; i.e., the bed was formed during the dry era [before the area became a sea] by the raising and lowering of the earth's crust.

As a result of more precise studies made of the circumpolar parts of the underwater range imeni M. V. Lomonosov, the location of this range has been more precisely determined, and it is now known that the range extends from the area of the North Pole in the direction of Greenland and Ellsmere Island. It has also been established that the sides of the range are steep and that there is a deep trough running along the ocean bottom at the side of the range. In addition to the underwater mountain range imeni M. V. Lomonosov, other upheavals have been found on the ocean floor, all of which divide the Arctic Ocean into several deep-water declivities.

New data have been gathered on the penetration of warm air masses from the Pacific Ocean into high latitudes via the Barents and Chukchi seas. These masses spread over the 200-meter-thick surface layer of cold air and rise through the troposphere to a height of 7-9 kilometers, reaching to the periphery of the anti-cyclone centered over Alaska.

In the situation studied, a stationary, slowly filling cyclone was located over the circumpolar area, and at the western periphery of this cyclone a mass of Arctic air was cascading on to the European part of the Soviet Union and western Siberia.

In the course of the ice drift, many determinations have been made relative to the earth's magnetic pole. At several points, variations in the earth's magnetism were registered with the aid of portable magnetic-variation stations. Information gathered on magnetic deviations in the circumpolar area indicates that there is some connection between these deviations and the underwater range imeni Lomonosov.

Observations made of drift ice have permitted conjectures to be made on the movement of ice over the entire Arctic Ocean. These observations have confirmed the dependence of drift ice on atmospheric conditions, hydrological conditions, relief of the ocean bottom, and other natural phenomena. New data have also confirmed the presence in the eastern part of the Arctic Ocean (the eastern part as delineated by the range imeni Lomonosov) of a clockwise or anticyclonic ice drift. In the western section of the Arctic Ocean, the circulation of ice is in a counterclockwise direction, and a significant portion of the ice here carries from the Arctic Ocean to the Greenland and Barents seas. The drift of ice from the Arctic Ocean to the Greenland Sea is by no means constant, however, and there may be considerable interruptions during which the ice drifts on a closed track in a counterclockwise direction. Depending on conditions, the extent of this zone of circulation varies to a considerable degree; from a comparatively small area encompassing only the northern part of the Laptev Sea, it may expand under certain conditions to a very large region sometimes including almost all of the western part of the Arctic Ocean.

These basic drift charts and other information on ice movements allow some practical conclusions to be made on the formation of the Ayonskiy and Taymyrskiy ice masses which lie across the Northern Sea Route. [Presumably these are masses which form at Ayon Island and at the Taymyr Peninsula.]

A slight movement of old ice has been established in the eastern part of the Arctic Ocean bordering the Canadian Archipelago, Beaufort Sea, and part of the

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Chukchi Sea. In these areas, the ice is almost stationary, is very thick, and apparently seldom drifts beyond the limits of the eastern part of the ocean.

In the western part of the ocean, the ice is generally 2 years old and not as thick as in the eastern half of the ocean. It is more often replaced as the old ice drifts to the Greenland and Barents seas.

Ice regions have been defined which undergo the utmost in dynamic action, and on the other hand, regions have been located with the greatest stability and the smallest amounts of pack ice.

Observations of icebergs (both from the drifting stations and from the air) have permitted precise definitions to be made as to the area of their origin and the route they take across the Arctic Ocean. It has also been established that icebergs do not enter their drifting tracts with complete regularity. Among the icebergs of the western part of the ocean, some very large ones have been sighted by the expedition. These were flat in form, covered a large area, and had considerable height.

The expeditions also made the interesting observation that ice is "rejuvenated" annually, in the sense that the upper surface thaws while the lower surface is adding new ice.

Animal life studied by the drifting stations includes ducks, gulls, snow buntings, and snipe. Observations indicate that flocks of migratory birds may come to the ice from a distance of thousands of kilometers. In the sea, fish, jellyfish, and an abundance of plankton have been found.(2)

Life on the ice has settled into a normal pattern for the members of the drifting stations. One of the greatest problems met by the expedition is the large amount of water formed by melting snow, which began with the advent of warmer summer temperatures. During the spring, the temperatures went as low as 15-20 degrees below zero centigrade, but with the arrival of the polar summer the temperature rose to 1-2 degrees above zero. These temperatures were accompanied by winds, fog, and rain, all of which combined to thaw the snow cover rapidly. As a result, entire lakes and torrential streams formed on the ice. A considerable amount of time was devoted to moving dwellings and equipment to dry areas and to chopping canals and holes in the ice to allow the fresh water to run off into the sea.(3, 4)

The scientific work at the stations is being carried on, in shifts, around the clock. In some cases, there has been a voluntary combination of duties. Dr Paleyev at Severnyy Polyus-4, for example, has familiarized himself with meteorology and is now helping in this work. Thanks to the presence of the helicopters, observation by the camps is not confined to a narrow area. At Severnyy Polyus-4, Candidate of Geographic Sciences Dralkin and the young specialist, Izvekov, are using the helicopters to make meteorological observations at ice fields far from the camp.(6)

In the camps themselves, life is quite comfortable. They are equipped with radios and telephones and are in constant touch with the mainland. Films are shown during leisure hours in the "community room," the largest dwelling at the camps, composed of two tents sewed together. All members of the stations meet in these community rooms three times a day for meals. The meals are prepared from a variety of products, including fresh meat, fresh fish, semiprocessed foods, meat dumplings, smoked products, honey, preserves, and chocolate. Fresh fruit and vegetables (as well as letters and newspapers from home) are brought in regularly from the mainland.

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A small library is available to the camp workers, and a special tent at the edge of the camp is fitted out as a bathhouse.(3)

Radio broadcasts are heard daily from Moscow, and the party and Komsomol organizations give lectures on political and scientific themes.(6)

As mentioned previously, the 1954 Arctic expedition includes an aerial research group in addition to the two drifting stations.(2) The group operates to the circumpolar area from Dikson.(4) It is under the direction of Ivan Ivanovich Cherevichnyy, chief of the aerial force, and Mikhail Yemel'yanovich Ostrekin, director of scientific work in this area. In addition to aiding in the meteorological and ice observations mentioned above, the flying group has gathered valuable data on the underwater mountain range imeni Lomonosov and the Asiatic continental slope.

Dolgin, chief of the aerial observers, Gordiyenko, senior scientific associate, and Volkov, all Candidates of Geographic Sciences, have made valuable contributions to Arctic research.(2)

[Note: Photographs of the drifting stations appear in Pravda, 20 July 1954, Gudok, 20 July 1954, Vodnyy Transport, 27 July 1954-10 August 1954, Smena, No 12, June 1954, and Ogonek, No 30, 31, 32, 1954.

## SOURCES

1. Moscow, Pravda, 17 Jul 54 (Dispatch from Tass)
2. Ibid., 18 Jul 54 (Article by V. Burkhanov)
3. Ibid., 19 Jul 54 (Articles by A. F. Treshnikov and Ye. I. Tolstikov)
4. Ibid., 20 Jul 54 (Excerpts from diary of V. Vavilov, Pravda special correspondent)
5. Ibid., 21 Jul 54 (Excerpts from diary of V. Vavilov)
6. Moscow, Izvestiya, 18 Jul 54 (Article by M. Vodop'yanov)
7. Moscow, Vodnyy Transport, 3 Aug 54

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